

NEW SPECIES, STAGE DESCRIPTION, AND RECORDS OF *BAETODES* (EPHEMEROPTERA: BAETIDAE) FROM MEXICO AND CENTRAL AMERICA¹

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ABSTRACT: *Baetodes deludens*, n. sp., is described from larvae from Costa Rica. *Baetodes pictus* is newly described from male and female adults and its range extended to include Sonora. *Baetodes deficiens* is newly reported from Sonora and Costa Rica. *Baetodes fuscipes* is newly reported from Guatemala. *Baetodes longus* is newly reported from Nuevo León. *Baetodes noventus* and *B. tritus* are newly reported from Costa Rica.

Needham and Murphy (1924) erected the genus *Baetodes* for *B. serratus* Needham and Murphy, a species from Brazil that they described from larvae only. These larvae and all those known since are consistently discernible from other small minnow mayflies (family Baetidae) by their possession of very long legs, ventrally oriented gills on abdominal segments 1-5, tergal tubercles, and stout subapical setae on the claws.

Additional species of *Baetodes* have been described from the Western Hemisphere by Traver (1943, 1944), Demoulin (1955), Mayo (1968, 1972, 1973), Koss (1972), Cohen and Allen (1972, 1978), and McCafferty and Provonsha (1993). When subsequent synonyms (Edmunds 1974, Cohen and Allen 1978) and recombinations (Flowers 1987) are considered, it brings the past total of species of *Baetodes* to 30. Of these, 13 are known from South America, five are known from North America (mainly Mexico), seven are known from Central America, and five are known from both North and Central America. Lists of *Baetodes* species for the various regions may be found in Hubbard and Peters (1981), McCafferty and Waltz (1990), and McCafferty and Lugo-Ortiz (1995). Herein we add one new species from Central America.

We also provide the first description of adults of one species, so that seven of the 30 species are now known as adults. Whereas larvae of *Baetodes* are among the most distinctive of all Baetidae, adult generic characterization has been problematic. Traver (1943) associated the first known adults of the genus with respect to the Venezuelan species *B. spinifer* Traver. She based this association on the presence of remnants of larval abdominal tubercles and very long tibiae on the adults. Koss (1972) questioned Traver's assignment of such adults to *Baetodes* because of variations from *B. spinifer* that he found in

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reared adults of *B. edmundsi* Koss. Koss (1972) and Edmunds *et al.* (1976) indicated that the hind margin of the forewing of *Baetodes* adults was subparallel to the costal margin, that interspaces between marginal intercalaries of the forewings were subequal to the intercalary lengths, and that these characteristics were diagnostic for the genus. Flowers (1987), however, did not find these characteristics present in his reared adults of *B. tritus* Cohen and Allen and *B. velmae* Cohen and Allen. We also have found these characters unreliable for generic identification [see also McCafferty and Provonsha (1993)]. Flowers (1987) suggested the use of the mesal projection of the first segment of the male forceps, the tibia to femur ratio of the male forelegs, and the attenuated metanotal projection to identify *Baetodes* adults. More species must be known as adults to confirm this.

Baetodes has evident Neotropical affinities (McCafferty and Waltz 1990). On the basis of demographic data McCafferty *et al.* (1992) hypothesized that the genus had a recent Mesoamerican center of dispersal. However, McCafferty *et al.* (1992) also indicated the most plesiomorphic species of the genus occur in South America, suggesting an origin in that continent. In addition, *Baetodes* shares a number of synapomorphies with the Neotropical genus *Moribaetis* Waltz and McCafferty, and evidently does not share any apomorphies with Nearctic baetid lineages (Waltz, pers. comm.).

Following is an alphabetical treatment of the new species and species for which we provide a new stage description and new distributional records from Mexico and Central America. The material examined for this report is housed in the Purdue Entomological Research Collection (PERC), West Lafayette, Indiana, and the collection of Florida A & M University (FAMU), Tallahassee.

Baetodes deficiens Cohen and Allen

Material examined. COSTA RICA, Guanacaste Prov., Río Tenorio at Finca La Pacífica, E of Panamerican Hwy, II-2-11-1969, W. P. McCafferty, larvae, deposited at PERC; MEXICO, Sonora Sta, stream E of Yécora, VIII-24-1986, B. C. Kondratieff, larva, deposited at PERC.

Discussion. *Baetodes deficiens* has a widespread distribution in Central America and Mexico (see Mayo 1972, Cohen and Allen 1972, Flowers 1987, Lugo-Ortiz and McCafferty 1994). McCafferty (1985) identified the Costa Rican material as *B. caritus* Cohen and Allen, but it agrees more with the description of *B. deficiens* as modified by Flowers (1987), and the records should be rectified. Cohen and Allen (1978) described the larva of this species. Flowers (1987) described the male and female subimagos. Adults remain unknown.

Baetodes deludens Lugo-Ortiz and McCafferty, NEW SPECIES

(Fig. 1)

Larva. Body length: 3.2 mm; caudal filaments: 3.5 mm. Head: Coloration pale brown. Area between frontal suture and median ocellus medium brown, forming inverted V. Area surrounding coronal suture medium brown. Antennae pale brown; scapes and pedicels bare. Labrum narrower than interantennal distance, with anteromedial emargination and sclerotized cleft line at midline of anteromedial emargination; five to six long, simple setae arranged in row anteriorly. Right mandible [as in Cohen and Allen (1978): Fig. 2] 4 + 3 denticles; simple setae present between protheca and molar. Left mandible [as in Cohen and Allen (1978): Fig. 3] 3 + 3 denticles, distal denticle much larger than remainder and appearing worn; no setae between protheca and molar; short triangular process at base of molar. Maxillae robust; maxillary palps extending almost as far as galealacinia; palp segment 2 almost twice as long as segment 1, with very fine, simple setae distally. Labium slender; palp segment 1 almost as long as segments 2 and 3 combined; segment 2 subequal to 3; segment 3 ellipsoidal, with short, robust and long, fine, simple setae distally; glossae shorter than paraglossae, with four to five long, simple setae laterally; paraglossae with three to four distal rows of long, simple setae. Thorax: Color medium brown, with no distinct pattern. Notae bare; pro- and mesonotum with pair of very small, submedian nodules; metanotum darker than pro- and mesonotum, with well-developed median tubercle. Sterna cream to pale brown. Hindwingpads absent. Fingerlike coxal gills double and longer than median length of trochanters. Legs cream to pale brown, except for sclerotized rounded apices of femora, distal ends of tibiae (especially ventrally), and tarsal claws; dorsal margin of femora with eight to nine long clavate setae (distal two setae almost contiguous and parallel to each other), with numerous long, slender, simple setae between clavate setae, and ventral margin bare, except for almost imperceptible, robust, simple setae; tibiae with numerous long, slender, simple setae dorsally, one to two long, robust, simple setae distally, many short, stout, simple setae ventrally, and two short, robust simple setae distally; tarsi with scattered fine, simple setae dorsally and seven to eight short, robust setae ventrally; tarsal claws with five to seven small denticles. Abdomen (Fig. 1): Color medium brown, with distinct pattern. Terga 1-6 with dark brown anterior and posterior margins, width of dark margins in terga 5-6 somewhat reduced compared to anterior terga; terga 7-9 with dark anterior margins, width of dark margin in tergum 9 reduced and somewhat faded; tergum 10 pale brown. Dorsal median tubercles on terga 1-9, well developed and erect on terga 1-4, well developed and somewhat angled on tergum 5, well-developed and strongly angled on terga 6-7, and poorly developed on terga 8-9. Sterna cream to pale brown. Gills rounded, ventrally oriented, and pale; gill 5 highly reduced relative to anterior gills. Caudal filaments cream to pale brown.

Adult. Unknown.

Material examined. Holotype: Female larva, COSTA RICA, Puntarenas Prov., Río Jaba at rock quarry, 1.4 km (air) W of Las Cruces, 1150 m, 8.79°N/92.97°W, VI-14-1986, Holzenthal, Heyn, Armitage, deposited at PERC. Paratypes: Two male larvae, same data as holotype, deposited at FAMU and PERC. Additional material examined: Two immature female larvae, same data and deposition as paratypes.

Etymology. The specific epithet is a Latin word meaning deceptive. It is an allusion to the similarity of this species to other species in the genus with tubercles on terga 1-9.

Discussion. *Baetodes deludens* will key to *B. noventus* with Cohen and Allen's (1978) key on the basis of the presence of tubercles on terga 1-9. However, it differs from *B. noventus* in the presence of two coxal gills on every leg and in abdominal coloration (Fig. 1). It also appears somewhat similar to *B. bibranchius* McCafferty and Provonsha, but differs from that species in its abdominal coloration and the orientation of the abdominal tubercles.

Baetodes fuscipes Cohen and Allen

Material examined. GUATEMALA, Solala Prov., Río at Panajachel, I-16-1989, B. C. Kondratieff, larva, deposited at PERC.

Discussion. *Baetodes fuscipes* is known from northwestern and eastern Mexico south to Honduras (see Mayo 1972, Cohen and Allen 1972, Allen and Murvosh 1987). The new record from Guatemala was thus expected. The species is known only from the larval stage (Cohen and Allen 1972).

Baetodes longus Mayo

Material Examined. MEXICO, Nuevo León Sta., Río Ramos, XII-20-1939, L. Berner, larva, deposited at PERC; Santiago, XII-20-1939, L. Berner, larvae, deposited at PERC.

Discussion. *Baetodes longus* was previously known from Tamaulipas only (Mayo 1973). The new records from Nuevo León slightly extend the known range of the species and suggest that it may occur in southwestern United States also. The species is known from larvae only.

Baetodes noventus Cohen and Allen

Material examined. COSTA RICA, Heredia Prov., Quebrada Salto in SW section of teaching area at La Selva, II-25-1969, W.P. McCafferty, larva, deposited at PERC.

Discussion. *Baetodes noventus* has a widespread distribution in Central America (see Cohen and Allen 1972). The new record from Costa Rica slightly extends its known range southward. The species is known from the larval stage only.

Baetodus pictus Cohen and Allen

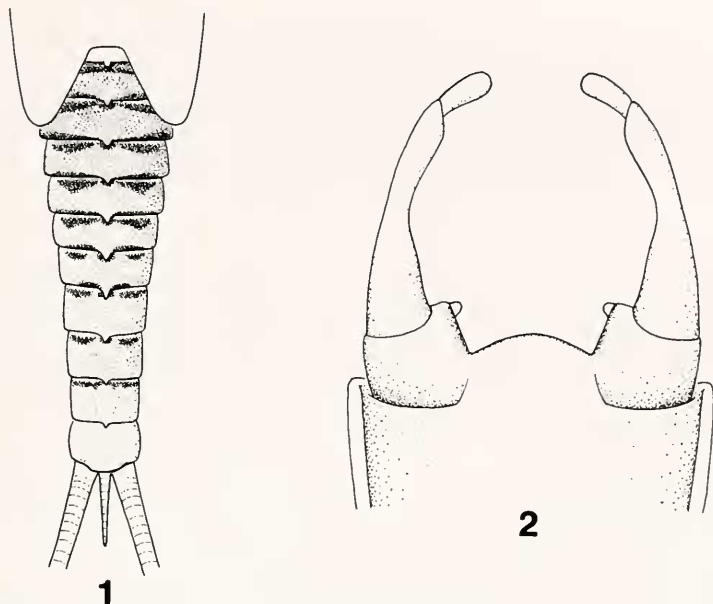
(Fig. 2)

Material examined. MEXICO, Chihuahua Sta., Río Gavalón, Gavalón Ranch, VIII-25-1986, B. C. Kondratieff, male and female adults, deposited at PERC.

Male Adult. Body length: 5.0 mm; wing: 5.0 mm; caudal filaments: unknown. Head: Face brown. Flagella, scapes, and pedicels light brown. Compound eyes black, except turbinate portion yellow. Thorax: Notum medium brown. Sterna pale brown, paler medially. Legs pale brown. Wings basally tinged with brown, particularly in basal region of costal area. Abdomen: Tergal color pattern as in Figure 11 of Cohen and Allen (1978). Tubercle remnants on terga 1-7; those on terga 8-9 inconspicuous. Sterna light brown. Genitalia as shown in Figure 2, with well-developed inner lobes on basal segments of forceps.

Female adult. Body length: 5.0 mm; wing: 5.3 mm; cerci: unknown. Body more robust than male. Abdominal coloration lighter than in male. Basal tinged of wings more intense.

Discussion. The male and female adults of *B. pictus* have not been described previously. The materials examined have the distinct abdominal



Figures 1-2. 1. *Baetodes deludens*, n. sp., larva, abdomen, dorsal view. 2. *Baetodes pictus*, male genitalia, dorsal view.

color pattern of the larva of *B. pictus*. Moreover, they have conspicuous remnants of tubercles on terga 1-7, and are within the size range provided by Cohen and Allen (1972, 1978) for the larvae. There are no discernible tubercle remnants on terga 8-9, but Cohen and Allen (1972, 1978) stated that those tubercles are difficult to see on the larvae. Therefore, the specimens described above are provisionally placed under *B. pictus*. The species was previously known from Veracruz only (Cohen and Allen 1972, 1978). The new record from Chihuahua extends its range northwestward.

Baetodes tritus Cohen and Allen

Material examined. COSTA RICA, roadside seep, Rt 2 W of km 234, 8.976°N/83.299°W, 100m, II-20-1986, Holzenthal, Morse, and Fasth, larvae, deposited at FAMU.

Discussion. *Baetodes tritus* is known from northeastern Mexico south to Panama (see Cohen and Allen 1972, 1978; Flowers 1987). The record from Costa Rica was thus expected. The species was originally described from the larva only (Cohen and Allen 1972). Flowers (1987) redescribed the larva and described the egg, female subimago, and male adult.

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